Complete Summary

GUIDELINE TITLE

Soft tissue masses.

BIBLIOGRAPHIC SOURCE(S)

Morrison WB, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Soft tissue masses. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [24 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Berquist TH, Dalinka MK, Alazraki N, Daffner RH, DeSmet AA, el-Khoury GY, Goergen TG, Keats TE, Manaster BJ, Newberg A, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Soft tissue masses. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):255-9.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Soft tissue masses

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Family Practice
Nuclear Medicine
Oncology
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for soft tissue masses

TARGET POPULATION

Patients with soft tissue masses

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
2. Ultrasound (US)
3. Computed tomography (CT)
    - With contrast
    - Without contrast
4. Magnetic resonance imaging (MRI)
    - Without contrast
    - Without and with contrast
5. Nuclear medicine (NUC), bone scan
6. Invasive (INV), arthrography

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1 to 9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a

consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Soft Tissue Mass

Variant 1: First study to order.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray	9	Necessary. Bone and soft tissue features assist in selecting second study.
US	1	Not first study.
CT	1	Not first study.
NUC, bone scan	1	Not first study.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI	1	Not indicated as first study, most often second study.
INV, arthrography	1	Invasive, only useful for communicating cyst.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Radiograph negative.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, without contrast	9	Start without contrast. If mass indeterminate for malignancy, use contrast.
MRI, without and with contrast	9	Start without contrast. If mass indeterminate for malignancy, use contrast.
US	7	With proper expertise, may be appropriate
CT, with contrast	4	May be useful if MRI is contraindicated.
CT, without contrast	1	
NUC, bone scan	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Radiograph calcified soft tissue mass.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, without contrast	9	If myositis ossificans is suspected.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, without contrast	9	If not demonstrated by CT to be myositis ossificans.
MRI, without and with contrast	9	If not demonstrated by CT to be myositis ossificans.
CT, with contrast	4	If not myositis ossificans and MRI contraindicated.
US	1	
NUC, bone scan	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Superficial or near joint with or without radiographic abnormalities.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, without contrast	9	Start without contrast. If mass indeterminate for malignancy, use contrast.
MRI, without and with contrast	9	Start without contrast. If mass indeterminate for malignancy, use contrast.
US	7	With proper expertise, could substitute for MRI. Especially if ganglion is suspected, particularly in the wrist.
CT, with contrast	4	May be useful if MRI is contraindicated.
CT, without contrast	1	
NUC, bone scan	1	
INV, arthrography	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Abdominal or chest wall.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray	9	Localization, calcification, etc., important for selecting additional studies.
CT, with contrast	9	
MRI, without contrast	7	May be limited due to motion artifact.
MRI, without and with contrast	7	May be limited due to motion artifact.
CT, without contrast	4	May be indicated in specific situations such as hernia.
NUC, bone scan	4	If expertise available. Depends on the specific question to be answered.
US	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary

Imaging techniques for patients with suspected soft tissue masses may be requested because of a painful or painless soft tissue abnormality palpated by the patient or physician or because of symptoms such as pain or other complaints with no detectable mass on physical examination. The type of imaging technique initially selected varies depending on the history and physical findings as well as the suspected location of the lesion. It is well known that biopsy of a presumed soft tissue mass without an imaging work-up is inadvisable for a number of reasons.

There has been tremendous progress in imaging evaluation of soft tissue masses over the years. Routine radiographs still play an important role in identifying certain features that may either allow the diagnosis to be established or indicate which procedure might be most appropriate for further evaluation. CT and US greatly improve the ability to detect and, in some cases, characterize the nature of soft tissue masses. With the advent of MRI, lesion detection, differentiation of normal anatomic variants from true lesions, and characterization of lesions has

improved because of the superior soft tissue contrast and multiple-image plane capabilities.

Routine radiography is an important first technique for evaluation of patients with suspected soft tissue abnormality, especially those that are deep and nonpalpable. Certain features on the routine radiograph may provide valuable insight into the most appropriate additional studies that may be required. For example, well-defined lucency in the soft tissues may indicate a lipoma that could be evaluated with either CT or MRI. Patients with subtle bone change or soft tissue calcification may be more appropriately studied with CT, because lesion characterization may be improved with this imaging technique. Also, lesions projecting from bone (i.e., osteochondroma or soft tissue component of a bone tumor) can present as deep soft tissue masses clinically.

Ultrasound is not frequently used for evaluating soft tissue masses at most institutions. This technique is valuable in differentiating cystic from solid lesions and has also been used to study vascularity of lesions. For soft tissue prominence at a joint, US may offer a specific diagnosis (e.g., ganglion cyst, paralabral or parameniscal cyst). However, US is not as useful for characterizing pathology or defining the extent of true tissue masses.

Since the introduction of MRI, CT has largely been replaced as the technique of choice for evaluation of soft tissue masses. However, in some cases, CT may still be appropriate for evaluating soft tissue lesions. Situations such as suspected lipoma, calcification in soft tissue lesions seen on routine radiographs, or suspected myositis ossificans based on clinical or radiographic data might be better evaluated with CT. Lipomas are easily characterized on both CT and MRI. In addition, patient size or location of lesion may dictate that CT would be the preferred technique. Such locations include the abdominal or chest wall, where motion artifact can create suboptimal imaging with MRI. A report of the Radiology Diagnostic Oncology Group on 133 soft tissue tumors suggested that MRI and contrast-enhanced CT are comparable with reference to determining tumor size and involvement of surrounding structures.

MRI has become the technique of choice for detecting and characterizing soft tissue masses. Its improved soft tissue contrast and multiple-image plane capabilities have provided significant advantages for lesion conspicuity, characterization, and determining the extent of involvement. Vascular structures can also be more easily identified and evaluated without the need for intravenous contrast agents. Vascular structures and neurovascular involvement are more easily defined in 20% of cases compared with CT. Cortical bone involvement by soft tissue masses can be identified equally by both CT and MRI. However, the extent of marrow involvement can be difficult to determine by CT, and there is evidence that tumor infiltration can extend beyond the apparent margin of the mass.

Though lesions are more easily detected with MRI, its ability to differentiate benign from malignant lesions remains controversial. Numerous studies have evaluated MR imaging features of soft tissue lesions. Reports discussing correct histologic diagnosis or differentiating benign from malignant lesions describe accuracy ranges from 24 to 90%. Though imperfect, the superior soft tissue contrast provided by T2-weighted MR images provides features that are useful for

characterizing lesions. Malignant lesions are heterogeneous (72 to 94%), larger (90% >33 mm), and more frequently involve bone and neurovascular structures. The pattern of gadolinium enhancement may help identify some lesions as malignant, such as myxoid liposarcoma, and has shown utility in evaluating aggressiveness of vascular and lipomatous masses. Contrast is useful for identifying cystic and necrotic components of soft tissue masses, helping to characterize lesions and identifying solid areas for biopsy. Dynamic gadolinium enhancement characteristics may be useful, but there is overlap between benign and malignant lesions. Advanced MRI techniques such as spectroscopy diffusion-weighted imaging have potential for differentiating benign from malignant lesions but need more refinement. Even when MRI cannot characterize the type of lesion, it remains very useful for percutaneous biopsy and surgical planning.

Radionuclide studies are not indicated in most situations for evaluation of soft tissue masses. Techniques such as positron emission tomography (PET) scanning have been used mainly for evaluating metastatic disease and follow-up of treated lesions.

Arthrography or invasive techniques are also rarely indicated, if at all, for evaluating soft tissue masses. Popliteal cysts or communicating cystic lesions can be identified by introducing contrast material into the joints. However, this is not a well-accepted technique and is rarely performed today. With few exceptions, such as arteriovenous (AV) malformations or hemangiomas, angiography is also not frequently performed for the detection or staging of soft tissue lesions.

Anticipated Exceptions

As a general rule, MRI is the technique of choice for evaluating patients with suspected soft tissue masses. There are some exceptions where other techniques may be of equal or greater value. CT may be of greater value in patients who demonstrate subtle cortical bone evolvement or soft tissue calcifications on routine radiographs. Patient size, patients with certain metallic or electrical implants, claustrophobic patients, and patients who are unable to remain motionless (because of pain, Parkinson's disease, etc.) for the length of an MRI examination may have to be studied with an alternate technique. CT would be selected in most situations.

Abbreviations

- CT, computed tomography
- INV, invasive
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- US, ultrasound

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for evaluation of patients with soft tissue masses

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Morrison WB, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Soft tissue masses. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [24 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: William B. Morrison, MD; Murray K. Dalinka, MD; Richard H. Daffner, MD; Arthur A. De Smet, MD; George Y. El-Khoury, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; Helene Pavlov, MD; David A. Rubin, MD; Robert Schneider, MD; Lynne S. Steinbach, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

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The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

Print copies: Available from American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on March 28, 2006.

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